

**OPTIMALISASI RUTE DISTRIBUSI MATRAS SPRING BED DENGAN  
MENGUNAKAN ALGORITMA GENETIKA PADA PENYELESAIAN  
*CAPACITATED VEHICLE ROUTING PROBLEM***

**Studi Kasus pada PT SMI**

**Hester Patmawati<sup>1</sup>, Yohanes Anton Nugroho<sup>2</sup>**

<sup>1</sup>Program Studi Teknik Industri, Fakultas Sain & Teknologi

Universitas Teknologi Yogyakarta

**ABSTRAK**

Pendistribusian merupakan salah satu proses penting pada proses bisnis yang menjadi bagian dari Supply Chain Management. Dalam proses pendistribusian sendiri sering terjadi berbagai macam kendala yang dapat mempengaruhi biaya pendistribusian. Kendala distribusi yang dialami oleh PT SMI dalam melakukan distribusi matras yang diproduksi kepada konsumen adalah kapasitas armada atau kendaraan yang belum memadai. Dengan pendistribusian kepada konsumen yang berada di seluruh Jawa tengah dan Yogyakarta, bahkan sudah merambah ke Jawa Barat. Berdasarkan permasalahan yang dihadapi oleh PT SMI, dapat dikategorikan sebagai kendala kapasitas dalam penentuan rute pengiriman atau CVRP. CVRP memiliki banyak penyelesaian yang dapat diterapkan guna mendapat rute perjalanan yang lebih optimal. Metode Algoritma Genetik merupakan salah satu metode perhitungan metaheuristic dimana metode ini memiliki suatu mekanisme pencarian yang terinspirasi oleh proses evolusi biologis makhluk hidup. Dari hasil pengolahan data yang telah dilakukan dapat dilihat perbandingan hasil keseluruhan jarak tempuh pendistribusian matras spring bed. Dimana terdapat perbedaan jarak tempuh sebesar 4,63% atau 117,65 Km dengan jarak awal sebesar 2690,13 km, dan jarak usulan sebesar 2572,48 km. Hal ini disebabkan pada kondisi awal pendistribusian dalam sekali pengiriman perusahaan menggunakan 6 kendaraan dengan kapasitas kurang dari 140 matras, sehingga 1 kendaraan bisa melakukan distribusi dua kali. Sedangkan pada rute usulan didapatkan skenario rute dengan memaksimalkan kapasitas dalam 1 kali pengiriman sehingga pendistribusian matras spring bed dapat dilakukan dengan lebih efisien dari rute sebelumnya.

**Keywords:** *Supply Chain Management*, VRP, CVRP, Algoritma Genetika, pendistribusian, matras

# **OPTIMIZATION OF SPRING BED MATTRESS DISTRIBUTION ROUTES USING GENETIC ALGORITHM FOR CAPACITATED VEHICLE ROUTING PROBLEM SOLUTION**

## **Case Study at PT SMI**

### **ABSTRACT**

Distribution is one of the essential processes in business processes that are part of Supply Chain Management. In the distribution process itself, there are often various kinds of obstacles that can affect distribution costs. The distribution constraint experienced by PT SMI in distributing the mattresses produced to consumers is the inadequate capacity of the fleet or vehicles. With distribution to consumers throughout Central Java and Yogyakarta, it has even penetrated West Java. Based on the problems faced by PT SMI, it can be categorized as a capacity constraint in determining the delivery route or CVRP. CVRP has many solutions that can be applied to get a more optimal travel route. The genetic Algorithm method is one of the metaheuristic calculation methods where this method has a search mechanism inspired by the biological evolution of living things. The results of data processing that has been done show the comparison of the results of the overall mileage distribution of the spring bed mattress. There is a difference in mileage of 4.63% or 117.65 km with the initial distance of 2690.13 km and the proposed distance of 2572.48 km. This is due to the initial distribution conditions in one shipment. The company uses six vehicles with a capacity of fewer than 140 mattresses so that one car can distribute twice. While on the proposed route, the routing scenario is obtained by maximizing capacity in 1 delivery so that the distribution of the spring bed mattress can be done more efficiently than the previous route.

**Keywords:** Supply Chain Management, VRP, CVRP, Genetic Algorithm, distribution, mattress

**Daftar Pustaka**

- C. N. Olivia, “Penyelesaian *vehicle routing problem with simultaneous pick up and delivery* menggunakan metode *Constrain Programming*”, Skripsi, Institut Teknologi Harapan Bangsa, Bandung, 2019
- Dellaert, N., Van Woensel, T., Crainic, T. G., & Dashty Saridarq, F. (2021). A multi-commodity two-Echelon capacitated vehicle routing problem with time windows: Model formulations and solution approach. *Computers and Operations Research*, 127, 105154. <https://doi.org/10.1016/j.cor.2020.105154>
- Fatnita, A. V., & Lukmandono. (2020). Optimasi Rute Distribusi Tabung LPG 3 Kg Dengan Menggunakan Alogaritma Genetika Pada Penyelesaian Capacitated Vehicle Routing Problem (CVRP) (Studi kasus pada PT. Jana Pusaka Migas). *Prosiding Seminar Nasional Sains Dan Teknologi Terapan*, 1(1), 39. <https://ejournal.itats.ac.id/sntekpan/article/view/1213>
- Hidayatullah, W. M. (2019). *Solusi Capacitated Vehicle Routing Problem with Time Windows Sistem Distribusi LNG Papua Dengan Algoritma Ant Colony Optimization*. [https://repository.its.ac.id/60312/%0Ahttps://repository.its.ac.id/60312/1/09211650014033-Master\\_Thesis.pdf](https://repository.its.ac.id/60312/%0Ahttps://repository.its.ac.id/60312/1/09211650014033-Master_Thesis.pdf)
- Irman, A., Ekawati, R., & Febriana, N. (2017). Optimalisasi Rute Distribusi Air Minum Quelle Dengan Algoritma Clarke & Wright Saving Dan Model Vehicle Routing Problem. *Seminar Nasional Inovasi Dan Aplikasi Teknologi Di Industri*, 1–7. <http://ejournal.itn.ac.id/index.php/seniati/article/view/839>
- Lukmandono, M. Basuki, M. J. Hidayat, and F. B. Aji, “Application of Saving Matrix Methods and Cross Entropy for Capacitated Vehicle Routing Problem (CVRP) Resolving,” *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 462, no. 1, 2019.
- Nono, V., Sofitra, M., & Wijayanto, D. (2020). Penyelesaian Capacitated Vehicle Routing Problem Dengan Menggunakan Algoritma Sweep Untuk Penentuan Rute Distribusi Untuk Depo Pt. Abc Kubu Raya. *Jurnal TIN Universitas Tanjungpura*, 4(2), 232–238.
- Qiao, Q., Tao, F., Wu, H., Yu, X., & Zhang, M. (2020). Optimization of a capacitated vehicle routing problem for sustainable municipal solid waste collection management using the PSO-TS algorithm. *International Journal of Environmental Research and Public Health*, 17(6). <https://doi.org/10.3390/ijerph17062163>
- Sitek, P., Wikarek, J., Ruczy ska-Wdowiak, K., Bocewicz, G., & Banaszak, Z. (2021). Optimization of capacitated vehicle routing problem with alternative delivery, pick-up and time windows: A modified hybrid approach. *Neurocomputing*, 423(xxxx), 670–678. <https://doi.org/10.1016/j.neucom.2020.02.126>
- S. Hanna, “Pemodelan *vehicle routing problem with time window* untuk mengoptimasi rute distribusi produk Sari Roti dengan metode algoritme *Sweep and Mixed Integer Linear Programming* (studi kasus: CV Jogja Transport),” Skripsi, Prodi Teknik Industri, Universitas Islam Negeri Sunan Kalijaga, Yogyakarta, 2017
- Tebaldi, L., Murino, T., & Bottani, E. (2020). An adapted version of the water wave optimization algorithm for the capacitated vehicle routing problem with time windows with application to a real case using probe data. *Sustainability (Switzerland)*, 12(9), 1–13. <https://doi.org/10.3390/su12093666>